

CLAIMS:

1. A capacitor fabrication method comprising:
forming a first capacitor electrode over a substrate;
atomic layer depositing an insulative barrier layer to oxygen diffusion over the first electrode;
forming a capacitor dielectric layer over the first electrode; and
forming a second capacitor electrode over the dielectric layer.
2. The method of claim 1 wherein the atomic layer deposited barrier layer has a thickness of less than about 12 Angstroms.
3. The method of claim 1 wherein the atomic layer deposited barrier layer has a thickness of less than about 6 Angstroms.
4. The method of claim 1 wherein the atomic layer deposited barrier layer contacts the dielectric layer.
5. The method of claim 1 wherein the atomic layer deposited barrier layer comprises Al_2O_3 .
6. The method of claim 1 wherein the atomic layer deposited barrier layer exhibits a K factor of greater than about 7 at 20 °C.

1 7. The method of claim 1 wherein the atomic layer deposited
2 barrier layer exhibits a K factor of about 10.

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4 8. The method of claim 1 wherein at least one of the first or
5 second electrodes comprises polysilicon and the dielectric layer comprises
6 oxygen.

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8 9. The method of claim 1 wherein the dielectric layer comprises
9 Ta_2O_5 or barium strontium titanate.

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11 10. The method of claim 1 wherein the dielectric layer is over
12 the barrier layer.

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14 11. The method of claim 10 further comprising atomic layer
15 depositing another insulative barrier layer to oxygen diffusion over the
16 dielectric layer.

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18 12. The method of claim 1 wherein the forming the first and
19 second electrodes and the dielectric layer occur by other than atomic
20 layer deposition.

1 13. A capacitor fabrication method comprising:
2 forming a first capacitor electrode over a substrate;
3 chemisorbing a layer of a first precursor at least one monolayer
4 thick over the first electrode;
5 chemisorbing a layer of a second precursor at least one monolayer
6 thick on the first precursor layer, a chemisorption product of the first
7 and second precursor layers being comprised by a layer of an insulative
8 barrier material;
9 forming a capacitor dielectric layer over the first electrode; and
10 forming a second capacitor electrode over the dielectric layer.

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12 14. The method of claim 13 wherein the first and second
13 precursor layers each consist essentially of a monolayer.

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15 15. The method of claim 13 wherein the first and second
16 precursor layers each comprise substantially saturated monolayers.

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18 16. The method of claim 13 wherein the first and second
19 precursor each consist essentially of only one chemical species.

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21 17. The method of claim 13 wherein the first precursor is
22 different from the second precursor.
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1 18. The method of claim 13 wherein the first precursor comprises
2 H₂O and the second precursor trimethyl aluminum.

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4 19. The method of claim 13 wherein the dielectric layer is over
5 the barrier layer, further comprising chemisorbing additional alternating
6 first and second precursor layers before forming the dielectric layer.

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8 20. The method of claim 19 wherein the barrier layer has a
9 thickness and a density effective to reduce oxidation of the first
10 electrode by oxygen from over the barrier layer.

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12 21. The method of claim 19 wherein the barrier layer has a
13 thickness of less than about 12 Angstroms.

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15 22. The method of claim 19 wherein the barrier layer has a
16 thickness of less than about 6 Angstroms.

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18 23. The method of claim 13 wherein the atomic layer deposited
19 barrier layer contacts the dielectric layer.

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21 24. The method of claim 13 wherein the barrier layer comprises
22 Al₂O₃.

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25. The method of claim 13 wherein the barrier layer exhibits
a K factor of greater than about 7 at 20 °C.

26. The method of claim 13 wherein the barrier layer exhibits
a K factor of about 10.

1 27. A capacitor fabrication method comprising:
2 forming an opening in an insulative layer over a substrate, the
3 opening having sides and a bottom;
4 forming a layer of polysilicon over the sides and bottom of the
5 opening;
6 converting the polysilicon layer to a first capacitor electrode
7 comprising hemispherical grain polysilicon;
8 conformally forming an insulative barrier layer on the first
9 electrode comprising Al_2O_3 , the barrier layer being sufficiently thick and
10 dense to reduce oxidation of the first electrode by oxygen diffusion from
11 over the barrier layer;
12 forming a capacitor dielectric layer comprising oxygen on the
13 barrier layer; and
14 forming a second capacitor electrode over the dielectric layer.

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16 28. The method of claim 27 wherein the forming a barrier layer
17 comprises atomic layer depositing a barrier layer to oxygen diffusion.
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1 29. The method of claim 27 wherein the forming the barrier
2 layer comprises:

3 chemisorbing a layer of a first precursor at least one monolayer
4 thick over the first electrode;

5 chemisorbing a layer of a second precursor at least one monolayer
6 thick on the first precursor layer, a chemisorption product of the first
7 and second precursor layers being comprised by the barrier layer.

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9 30. The method of claim 27 wherein the barrier layer has a
10 thickness of less than about 12 Angstroms.

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12 31. The method of claim 27 wherein the barrier layer exhibits
13 a K factor of greater than about 7 at 20 °C.

1 32. A capacitor construction comprising a first capacitor electrode
2 over a substrate, a capacitor dielectric layer over the barrier layer, a
3 second capacitor electrode over the dielectric layer, and an atomic layer
4 deposited insulative barrier layer to oxygen diffusion between the first
5 and second electrodes.

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7 33. The method of claim 32 wherein the barrier layer has a
8 thickness of less than about 12 Angstroms.

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10 34. The method of claim 32 wherein the barrier layer comprises
11 Al_2O_3 .

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13 35. The method of claim 32 wherein the barrier layer exhibits
14 a K factor of greater than about 7 at 20 °C.

1 36. A capacitor construction comprising:
2 a first capacitor electrode over a substrate;
3 an insulative barrier layer to oxygen diffusion over the first
4 electrode, the barrier layer comprising a chemisorption product of first
5 and second precursor layers;
6 a capacitor dielectric layer over the first electrode; and
7 a second capacitor electrode over the dielectric layer..
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9 37. The method of claim 36 wherein the barrier layer has a
10 thickness of less than about 12 Angstroms.
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12 38. The method of claim 36 wherein the barrier layer comprises
13 Al₂O₃.
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15 39. The method of claim 36 wherein the barrier layer exhibits
16 a K factor of greater than about 7 at 20 °C.
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